

WHAT IS CLAIMED IS:

1           1. A laser diode driver output stage for driving an  
2 associated laser diode device, the laser diode driver output  
3 stage comprising:

4           a driver circuit having at least one input node, a  
5 positive output node, and a negative output node, the driver  
6 circuit adapted to receive an input data signal at the at  
7 least one input node and provide an output signal to at  
8 least one of the positive output node and the negative  
9 output node in response to the data signal;

10           a transformer having a positive terminal of a first  
11 side coupled to the positive output node of the driver  
12 circuit, a negative terminal of the first side coupled to  
13 the negative output node, and a positive terminal of a  
14 second side coupled to the positive output node;

15           an RC network coupled between the negative output node  
16 of the driver circuit and the negative terminal of the first  
17 side of the transformer, the RC network adapted to suppress  
18 ringing of the output signal from the positive output node;  
19 and

20                   a bias current generator coupled to a negative terminal  
21                   of the second side of the transformer, the bias current  
22                   generator adapted to provide a bias current to the negative  
23                   terminal of the second side, the transformer adapted to  
24                   isolate the bias current from fluctuations in the output  
25                   signal, whereby the output signal and bias current are  
26                   provided to the associated laser diode device.

1                   2. The laser diode driver output stage of claim 1,  
2                   wherein the first side of the transformer comprises a  
3                   primary side, and the second side of the transformer  
4                   comprises a secondary side.

1                   3. The laser diode driver output stage of claim 1,  
2                   wherein the ringing of the output signal is caused by at  
3                   least one of a parasitic capacitance of the laser diode  
4                   device and a wire bond inductance at the positive output  
5                   node of the driver circuit.

1           4. The laser diode driver output stage of claim 1,  
2 further comprising:

3           a first side resistor coupled in parallel between the  
4 positive terminal of the first side of the transformer and  
5 the negative terminal of the first side of the transformer.

1           5. The laser diode driver output stage of claim 1,  
2 further comprising:

3           a second side resistor coupled in parallel between the  
4 positive terminal of the second side of the transformer and  
5 the negative terminal of the second side of the transformer,  
6 the second side resistor adapted to suppress ringing  
7 generated by at least one of a parasitic capacitance of the  
8 bias current generator and an inductance of the second side  
9 of the transformer.

1           6. The laser diode driver output stage of claim 1,  
2 wherein the driver circuit comprises an output switch  
3 architecture.

1           7. The laser diode driver output stage of claim 1,  
2       wherein the driver circuit comprises a differential  
3       amplifier.

1           8. The laser diode driver output stage of claim 1,  
2       wherein the driver circuit comprises:

3            a first switch transistor adapted to receive a first  
4       differential input data signal of the input data signal at  
5       a first gate node; and

6            a second switch transistor adapted to receive a second  
7       differential input data signal of the input data signal at  
8       a second gate node,

9            wherein a first emitter node of the first switch  
10      transistor is coupled to a second emitter node of the second  
11      switch transistor, a first collector node of the first  
12      switch transistor is coupled to the negative output node, and  
13      a second collector node of the second switch transistor is  
14      adapted to provide the output signal to the positive output  
15      node.

1           9. The laser diode driver output stage of claim 8,  
2 further comprising a modulation current generator coupled  
3 to the first emitter node and the second emitter node.

1           10. The laser diode driver output stage of claim 1,  
2 further comprising a pre-driver circuit adapted to provide  
3 the input data signal to the driver circuit.

1           11. A laser diode driver output stage for driving an  
2 associated laser diode device, the laser diode driver output  
3 stage comprising:

4           a driver circuit having at least one input node, a  
5 positive output node, and a negative output node, the driver  
6 circuit adapted to receive an input data signal at the at  
7 least one input node and provide an output signal to at  
8 least one of the positive output node and the negative  
9 output node in response to the data signal;

10           a transformer having a positive terminal of a first  
11 side coupled to the positive output node of the driver  
12 circuit, a negative terminal of the first side coupled to  
13 the negative output node, and a positive terminal of a  
14 second side coupled to the positive output node; and

15           a bias current generator coupled to a negative terminal  
16 of the second side of the transformer, the bias current  
17 generator providing a bias current to the negative terminal  
18 of the second side, the transformer adapted to isolate the  
19 bias current from fluctuations in the output signal, whereby  
20 the output signal and bias current are provided to the  
21 associated laser diode device.

1           12. The laser diode driver output stage of claim 11,  
2       wherein the first side of the transformer comprises a  
3       primary side, and the second side of the transformer  
4       comprises a secondary side.

1           13. The laser diode driver output stage of claim 11,  
2       further comprising:  
3           an RC network coupled between the negative output node  
4       of the driver circuit and the negative terminal of the first  
5       side of the transformer, the RC network adapted to suppress  
6       ringing of the output signal from the positive output node.

1           14. The laser diode driver output stage of claim 13,  
2       wherein the ringing of the output signal is caused by at  
3       least one of a parasitic capacitance of the laser diode  
4       device and a wire bond inductance at the positive output  
5       node of the driver circuit.

1           15. The laser diode driver output stage of claim 11,  
2 further comprising:

3           a first side resistor coupled in parallel between the  
4 positive terminal of the first side of the transformer and  
5 the negative terminal of the first side of the transformer.

1           16. The laser diode driver output stage of claim 11,  
2 further comprising:

3           a second side resistor coupled in parallel between the  
4 positive terminal of the second side of the transformer and  
5 the negative terminal of the second side of the transformer,  
6 the second side resistor adapted to suppress ringing  
7 generated by at least one of a parasitic capacitance of the  
8 bias current generator and an inductance of the second side  
9 of the transformer.

1           17. The laser diode driver output stage of claim 11,  
2 wherein the driver circuit comprises an output switch  
3 architecture.

1           18. The laser diode driver output stage of claim 11,  
2       wherein the driver circuit comprises a differential  
3       amplifier.

1           19. The laser diode driver output stage of claim 11,  
2       wherein the driver circuit comprises:

3           a first switch transistor adapted to receive a first  
4       differential input data signal of the input data signal at  
5       a first gate node; and

6           a second switch transistor adapted to receive a second  
7       differential input data signal of the input data signal at  
8       a second gate node,

9           wherein a first emitter node of the first switch  
10      transistor is coupled to a second emitter node of the second  
11      switch transistor, a first collector node of the first  
12      switch transistor is coupled to the negative output node, and  
13      a second collector node of the second switch transistor is  
14      adapted to provide the output signal to the positive output  
15      node.

1           20. The laser diode driver output stage of claim 19,  
2 wherein the first switch transistor comprises a first  
3 bipolar junction transistor, and the second switch  
4 transistor comprises a second bipolar junction transistor.

1           21. The laser diode driver output stage of claim 19,  
2 further comprising a modulation current generator coupled  
3 to the first emitter node and the second emitter node.

1           22. The laser diode driver output stage of claim 11,  
2 further comprising a pre-driver circuit adapted to provide  
3 the input data signal to the driver circuit.

1           23. A method of providing an improved drive signal  
2 from a laser diode driver output stage to a laser diode  
3 device, the method comprising the steps of:

4           receiving an input data signal at at least one input  
5 node of a driver circuit;

6           providing an positive output signal from the driver  
7 circuit to a positive output node in response to the data  
8 signal;

9           providing a negative output signal from the driver  
10 circuit to a negative output node in response to the data  
11 signal;

12           receiving the positive output signal at a positive  
13 terminal of a first side of a transformer and a positive  
14 terminal of a second side of the transformer;

15           receiving the negative output signal at a negative  
16 terminal of the first side of the transformer;

17           providing a bias current to a negative terminal of the  
18 second side of the transformer from a bias current  
19 generator; and

20           isolating the bias current from fluctuations in at  
21 least one of the positive output signal and the negative

22           output signal, whereby the output signal and bias current  
23           are provided to the laser diode device.

1           24. The method of claim 23, wherein the first side of  
2           the transformer comprises a primary side, and the second  
3           side of the transformer comprises a secondary side.

1           25. The method of claim 23, further comprising the  
2           step of:

3               suppressing ringing of the positive output signal from  
4           the positive output node using an RC network coupled between  
5           the negative output node of the driver circuit and the  
6           negative terminal of the first side of the transformer.

1           26. The method of claim 25, wherein the ringing of the  
2           positive output signal is caused by at least one of a  
3           parasitic capacitance of the laser diode device and a wire  
4           bond inductance at the positive output node of the driver  
5           circuit.

1           27. The method of claim 23, further comprising the  
2 step of:

3           suppressing ringing generated by at least one of a  
4 parasitic capacitance of the bias current generator and an  
5 inductance of the second side of the transformer by coupling  
6 a side resistor in parallel between the positive terminal  
7 of the second side of the transformer and the negative  
8 terminal of the second side of the transformer.

1           28. A driver output stage for driving an associated  
2 device, the driver output stage comprising:

3           a driver circuit having at least one input node, a  
4 positive output node, and a negative output node, the driver  
5 circuit adapted to receive an input data signal at the at  
6 least one input node and provide an output signal to at  
7 least one of the positive output node and the negative  
8 output node in response to the data signal;

9           a transformer having a positive terminal of a first  
10 side coupled to the positive output node of the driver  
11 circuit, a negative terminal of the first side coupled to  
12 the negative output node, and a positive terminal of a  
13 second side coupled to the positive output node; and

14           a bias current generator coupled to a negative terminal  
15 of the second side of the transformer, the bias current  
16 generator providing a bias current to the negative terminal  
17 of the second side, the transformer adapted to isolate the  
18 bias current from fluctuations in the output signal, whereby  
19 the output signal and bias current are provided to the  
20 associated device.

1           29. The driver output stage of claim 28, wherein the  
2 first side of the transformer comprises a primary side, and  
3 the second side of the transformer comprises a secondary  
4 side.

1           30. The driver output stage of claim 28, further  
2 comprising:

3           an RC network coupled between the negative output node  
4 of the driver circuit and the negative terminal of the first  
5 side of the transformer, the RC network adapted to suppress  
6 ringing of the output signal from the positive output node.

1           31. The driver output stage of claim 30, wherein the  
2 ringing of the output signal is caused by at least one of  
3 a parasitic capacitance of the associated device and a wire  
4 bond inductance at the positive output node of the driver  
5 circuit.

1           32. The driver output stage of claim 28, further  
2 comprising:

3           a first side resistor coupled in parallel between the  
4 positive terminal of the first side of the transformer and  
5 the negative terminal of the first side of the transformer.

1           33. The driver output stage of claim 28, further  
2 comprising:

3           a second side resistor coupled in parallel between the  
4 positive terminal of the second side of the transformer and  
5 the negative terminal of the second side of the transformer,  
6 the second side resistor adapted to suppress ringing  
7 generated by at least one of a parasitic capacitance of the  
8 bias current generator and an inductance of the second side  
9 of the transformer.

1           34. The driver output stage of claim 28, wherein the  
2 driver circuit comprises an output switch architecture.

1           35. The driver output stage of claim 28, wherein the  
2 driver circuit comprises a differential amplifier.

1           36. The driver output stage of claim 28, wherein the  
2 driver circuit comprises:

3           a first switch transistor adapted to receive a first  
4 differential input data signal of the input data signal at  
5 a first gate node; and

6           a second switch transistor adapted to receive a second  
7 differential input data signal of the input data signal at  
8 a second gate node,

9           wherein a first emitter node of the first switch  
10 transistor is coupled to a second emitter node of the second  
11 switch transistor, a first collector node of the first  
12 switch transistor is coupled to the negative output node, and  
13 a second collector node of the second switch transistor is  
14 adapted to provide the output signal to the positive output  
15 node.

1           37. The driver output stage of claim 36, wherein the  
2 first switch transistor comprises a first bipolar junction  
3 transistor, and the second switch transistor comprises a  
4 second bipolar junction transistor.

1           38. The driver output stage of claim 36, further  
2 comprising a modulation current generator coupled to the  
3 first emitter node and the second emitter node.

1           39. The driver output stage of claim 28, further  
2 comprising a pre-driver circuit adapted to provide the input  
3 data signal to the driver circuit.

1           40. The driver output stage of claim 28, wherein the  
2 driver output stage comprises a laser diode driver output  
3 stage.

1           41. The driver output stage of claim 28, wherein the  
2 driver output stage comprises an electroabsorption modulator  
3 driver output stage.